

AMERICAN

RAILROAD JOURNAL,

AND

MECHANICS' MAGAZINE.

No. 4, Vol. IX.
New Series.]

AUGUST 15, 1842.

[Whole No. 412.
Vol. XV.

For the American Railroad Journal and Mechanics' Magazine.]

*Ohio Railroad Office,
LOWER SANDUSKY, Aug. 6, 1842.*

Much has been written upon the subject of "the failures in the construction of Railways." But, in my opinion, the failure of many Railways is more to be attributed to a failure in their laying out than in their construction. If a road is injudiciously located a heavier expense must necessarily be incurred in its construction as well as in its repairs. All will admit that the construction and repairs are much augmented by deep cuts and heavy embankments. My opinion is; that if Engineers would be governed more by the natural surface of the ground, and run lighter and more frequent trains, an increase of dividends would be realized, and that, too, by a reduction of tolls, and at the same time be better adapted to the wants of the public. The improvements in motive power will go far to strengthen this position. It is now established beyond a doubt that gradients of 60 or even 80 feet, in the mile may be introduced with success. Then why not adopt the principle at once of vertical as well as horizontal curves, whether for short or long grades. If an elevation of 80 feet in the mile can be overcome for successive miles; it requires but a "schoolboy's sagacity" to see that a very short one can. I have adopted the maximum of departure, whether for ascending or descending grades at .015 in 15 feet or 1 to 100, and any maximum grade at 60 feet per mile. A road located and constructed upon this principle can be built with an edge rail for \$7,000 per

mile, excepting over a very rough and broken country, and where heavy viaducts are required. To run light and frequent trains over a road would increase the expense, but it would be more than met by a decrease in the cost of the repairs of the road and machinery.

Very respectfully yours,

C. WILLIAMS,
Chief Engineer O. R. R.

[For the American Railroad Journal and Mechanics' Magazine.]

We have much pleasure in presenting the following data, from the operations on the *Philadelphia and Pottsville* Railway for the year 1841, while open only to Reading, a point of no moment as compared with the mass of business which now awaits it at Pottsville, the centre of the Coal Fields, and which it is now making preparation to accommodate.

The details here furnished in regard to the expense of working this Road afford the amplest evidence of the cheapness with which it can be operated, and its ability to compete with the Canal and the Freighters on it is fully sustained. It brings the miner in immediate contact with the dealer, and even consumer, whom he will always be prepared to supply, without regard to seasons, at comparatively low and steady prices which heretofore have encumbered with too many intermediate agencies and other clogs.

This Report goes to show—

1st. That this Road has been adjusted and repaired at a cost for 56 miles of \$17,400, or \$310 per mile per annum.

2d. That 31,500 thro' passengers were carried, including all expense save repairs to Road and interest on capital, for \$13,600 or 43 cents each.

3d. That 28,500 tons of merchandize and road material were transported in like manner for 31,600, or \$1,10 per ton—\$32,600.

4th. That the machinery for engines, passenger and burden cars have been repaired at a cost on their value of about 5 per ct. pr an.

5th. That the consumption of oil and grease on the burthen trains for a distance of 116 miles has been at the fraction, per ton, of 3-4 of a cent.

6th. That the whole cost in wages, repairs, fuel, oil, etc., of an engine over this road per an., running daily has been about \$4,000.

7th. That the average loads, net freight, down the road, by one engine, have 201 tons.

8th. ditto up the road, 129 tons.

9th. That the entire cost of running an engine 116 miles, including the train capable of accommodating 150 passengers each way

but of which the average number between Reading and Philadelphia was only 87 per day—43½ up and 43½ down, amounts to \$18,84

This last item shows how very cheaply passengers could be carried were it possible to obtain always *full loads*, as will be the case with coal, and which is justly grounded the claim of carrying this latter so cheaply, and so much to the astonishment generally of the uninitiated part of the community.

Further economy also will hereafter be practicable on this road, in the fall of labor and of every article necessary in the maintenance and repair of road and machinery. By opening to it the forests above Reading, wood, for which they have heretofore paid \$3 per cord can be had for \$2½; and while this is the case, it will be cheaper than coal, seemingly the most natural resort for fuel in this case, but which will remain for the present as a grand resort for it, as wood shall grow dearer, and when the most economical mode of burning coal will be better understood. It should be borne in mind that the expense of adjustment of the track would not be materially increased, by the addition of 10 to 15 trains at moderate speed to the 2 or 3 which have so far passed over it at high velocities, and that the item of \$310 per mile would nearly suffice for at least the next 5 or 6 years, before which period few renewals could be required. This would only be the natural effect of good and efficient machinery well attended to and kept constantly braced up.

As a temporary and extraordinary measure, during the remaining half of the boating season on the Canal, to induce the trade to seek the Road more quickly, the rates on coal per Railway have been reduced to \$1 per ton from Sch. Haven, and 1,10 from Pottsville, but so soon as this transfer is effected, these rates will revert to 1,50, and to 1,75 per ton, at which the road can easily retain the trade, and at which it will in due time be able to make remunerating dividends.

As an auxiliary to the Coal trade, and consequently to its extension on this road we may note the introduction of the large 200 ton iron Steam Barges with Ericson's propellers, by which the freight to New York and the eastern ports will be materially reduced. Already are these boats on the Lakes and rivers of Canada, and they will soon be running between Philadelphia, Baltimore, Richmond, etc., through the Delaware and Chesapeake Canal, capable of accommodating a boat of near 200 tons of the iron kind.—This revolution in inland coastwise navigation should be carefully noted.

The Pennsylvania Railways have till now been pointed at as re-

markable only for *bad location, inefficient construction, and unfaithful management*; in future, however, the *Philadelphia and Pottsville* railway will redeem her on these three counts, and in *general benefit*, it will be without a rival. New York, more fortunate in having most of her flimsy roads (but of which even her canals are afraid) on a great thoroughfare of business and travel, their profitability has silenced reproach; and she yet needs a railway worthy of her and the age, which we trust she will soon have in the completion of the New York and Erie, and New York and Albany roads, now indispensably required by the rivalry with which she is encompassed from this improvement in other states.

For the American Railroad Journal and Mechanics' Magazine.]

GEORGIA RAILROAD.

We have been again favored with the annual report of the Georgia railroad for the year 1841, under the management of Mr. J. Edgar Thompson, to whom the curious in railways owe much for his intelligible and instructive statements, as throwing much light around the mysteries of this fruitful, but as yet but poorly appreciated source of wealth and prosperity in a community.

The line of this road in the last year has been greatly extended and is now composed as follows:

Main line, Augusta to Madison, 104 miles,

Branch, to Athens, 40 miles.

Do. to Warrenton, 3 1-2 miles; 147 1-2 miles, the whole of which is a flat bar of 29 lbs. per yard, except 29 miles of the main line which has a T rail of 46 lbs per yard. The shortest curve on the road is of 1,000 feet, and throughout its course to the Tennessee river, the grades will be no higher than from 33 to 37 feet per mile.

The receipts for 1841 were for 22,784 passengers,

averaging 3 1-4 each,	\$73,492
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11,000 tons goods averaging 11 or 11·14 per ton, 122,705	
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Mail, etc.,	28,055
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224,252

The expenses for 1841 were, say 40 per cent.

on gross receipts,	90,578
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Nett receipts,	\$133,734
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or about 6 per cent. on the whole cost of \$2,363,000, equal \$16,000 per mile.

An increase on the previous year's business of \$66,000 is exhibited, spite of the depressed state of trade, and while the branches,

as yet, yield but little or nothing compared with the expense of maintenance, although they are looked too as being soon important sources of revenue.

On the subject of increasing the rates of passenger fare from 5 cents per mile, as now charged, to 6 1-4 cents, deemed by Mr. Thompson as the most profitable *for this line of road*, he justly remarks:—

"There is doubtless a medium rate which will give to the company the largest profits, and this rate, instead of being uniform and applicable to all roads, as generally supposed, is controlled by the amount and character of the travel on each road. In Europe, and the more densely peopled sections of our own country, where in addition to an amount of travel proportioned to the greater population, there is a class of mechanics and laborers who would not use Railroads at high fares, low rates are no doubt both politic and profitable."

There are 12 locomotives of Baldwin's make on this road, of the 2d and 3d classes, or light and adapted as far as practicable to a flat bar road. These engines have mostly been now 5 or 6 years in use, and are returned as good, if not better than when new, after having run in that time over this trying description of road, 519,000 miles, at an expense for repairs of \$27,500, or at an average of 5 1-4 cents per mile, run at a speed of about 7 miles per hour for freight and 18 miles for passengers; and the whole expense of motive power for 1841, is here stated to have been 19 2-3 cents per mile, which corresponds nearly with the results on English roads, using coke as fuel, where it generally averages 20 cents per mile run. If, in England, the roads are better, the velocity, the source of most of the wear and tear, is at the same time much higher.*

The repairs and maintenance of road are also on a moderate scale, averaging for 1841, \$265 per mile, increased in this year by the usual amount of timber requiring renewal. In this southern latitude Mr. Thompson fixes the duration of the wooden structure in contact with the earth at 5 years only, but with this, the nature of the soil, the drainage of the road-bed, and description of wood must have much to do. In the north, with cedar and oak, 7 to 8 years, and if 9 and 10 years on favorable soils and *good drainage* might be given as an average. The kyanising preservative, will

* "Again, referring to the table with reference to the difference between carrying slowly and carrying quickly, we find that the total expense of carrying goods on the Liverpool and Manchester railway, at high velocities, is 2 1-2d per ton per mile, while on other roads, at moderate speeds, it is only 1d per ton per mile."—*Vignoles' Lectures*.

for a long time, in this country, be too costly in proportion to the cheap price of wood ; but Dr. Earle's process, now on trial, promises to do something, at a suitable cost, towards lessening, hereafter the expense of renewals to the wooden portions of the railway ; but, in fact, the perpetuation of the entire road and its machinery is now nothing so onerous, requiring only 30 to 40 per cent. on the gross receipts where they are at all commensurate to its cost, and leaving a fair dividend on its capital. The *uncommonly* perishable nature of the railway, so long a bug bear with the community, is thus fast losing its terrors with it, or at least, with that portion of it which has no adverse interest to blind them to the truth. It is believed by us, moreover, that all that could be desired for the economy of transportation on railways, is about being accomplished in new plans of engine, by Mr. Norris and Mr. Baldwin, by which the pressure on the rail from its drivers, with a large increase of power will not be greater than that of the wheels of the car behind it, say 1 1-2 to 2 tons ; and on this subject Mr. Thompson remarks :—

"Light engines have hitherto been so inefficient, that until the late improvement of Mr. Baldwin, by which the whole adhesion of the engine is obtained, and at the same time the track left free to adapt itself to the curves and undulations of the road I had despaired of their success, under any circumstances."

The subject of unguents has lately received much attention on most railways, and on the Georgia road this expense has been, at the very moderate average of 2 1-4 mills per mile, run by the trains, and one cent per mile of oil for the locomotives, owing, as Mr. Thompson adds—"to the adoption and adherence to the use with the freight trains of tallow instead of oil, using but a small quantity of the latter in cold weather. During the past winter we have been induced by the low price of lard to make trial of its properties, which has great satisfaction. Tallow, however, is to be preferred in warm weather." It is further said that "*lard oil*," a recent invention, can be profitably used on fine machinery, and consequently answer for the locomotives, the price now asked being 75 cents per gallon, and is likely to be much cheaper. These economies, together with the introduction of Babbitts white metal for journal Boxes, and in different parts of the locomotive, are doing much towards exterminating friction, the great enemy of railways, and give much greater force to the following remarks of Mr. Thompson :—

"It has been but 12 years since the introduction of railways as avenues of general commerce, and in that short space they have

grown so rapidly in public estimation that now the most sceptical on the subject are constrained to admit, that they are in almost all cases, greatly superior in point of economy for the transportation of passengers and freight to their former rivals, canals, or any other artificial way, in which the amount of trade to be accommodated is sufficient to authorize their construction in a substantial manner."

When we look at the liberal manner in which railways are treated in England and on the continent, by the different governments, owing to their *great services* in the transmission of the mail, it is mortifying to find our Post Office Department, driving hard bargains with our yet poor and struggling roads, to perform a duty which above all others, should not be allowed to fail for want of the requisite stimulus of a just remuneration. In this case it appears, that the department was unable to get a lower offer than \$350 per mile, by the stage coaches, at 7 miles per hour, and although the law of congress allowed an advance of 25 per cent over and above the tender by stage coach, which would have given the railway \$437 per mile—it was unable to obtain more than the *legal rate* as interpreted by the department of \$237 per mile, and this for performing night service. When the Postmaster General can be brought to understand more fully this subject, we believe, he will find, that as a minimum, \$125 and \$300 per mile as a minimum, will be no more than a fair remuneration to railways in the majority of cases for a daily mail.

We already owe much to Mr. Thompson, but it would still add to one debt in railway details, if he would in his next year's report, when the wooden structures of his road will have been nearly all renewed, furnish a tabular statement (as in the case of the performance of locomotives) of the whole expenses from the opening of his road, by which an average could be made of each department for the whole period, something by which he could judge of a southern road, as compared with a northern road, say the Utica and Schenectady, of which we annex a statement for his guidance, and which is about similar in character to the Georgia road, also a parallel case for vigilant management and good economy. Such examples give encouragement to the cause.

This road is connected with the Atlantic by means of the Charleston and Augusta railroad, and its great purpose is now to unite itself with the western water of the Mississippi and Ohio, at a point on the Tennessee river, which, once reached, would fix its prosperous destinies and make it difficult to give them a limit.

Georgia Railroad.

Statements of the results on the Utica and Schenectady Railway, 78 miles long with 22 miles turnouts, total cost \$1,968,000. Grades 25 feet per mile. The rail is a flat bar, and the wooden structures were principally of western and southern pine, and some red cedar. Its business is exclusively travel.

The following letter from Mr. Trautwine we give immediately on its receipt to our readers. It was furthest of all things from our intention, that any thing disrespectful or unfair, either to Mr. T. or any one else should appear on our pages, and we did not think the article contained any thing of that nature; we thought so at the time we first read it, and on a re-perusal we think so still. The quotations give a fair view of Mr. Trautwine's article which we had intended giving entire, but having no room to do so, we would not venture to make any other selections than the one relating to a collateral subject. As the right understanding of the matter is of some consequence, and as one party feels aggrieved, we shall publish the papers of Mr. Trautwine as rapidly as possible. A part will probably appear in this number.

Mr Schaeffer,

Dear Sir—Your Journal of July 1, contains a criticism on an article of mine which appears in the Franklin Journal of the Institute for the month of May, on the injudicious construction and machinery of many railroads in the United State. The author of the criticism alluded to, has a peculiar faculty of handling such subjects, which renders the task of rejoinder one of no ordinary labor; and therefore, as your Journal does not contain my paper, I must avail myself of the medium of your pages to request no one who reads the criticism will pass judgment upon my article, until he has read it also. Your correspondent would be much more likely to attain eminence as a critic, and as authority in disputed cases, were he to select as the object of his labors, such papers as appear in your Journal. His readers would thus be enabled to judge to some extent for themselves; and could not fail to be struck with the profundity of his remarks, and the astounding force of his arguments.

I am very respectfully yours, &c.

JOHN C. TRAUTWINE.

It was not in our *power* to avail ourselves of the polite invitation of the New York and Albany Railroad Company to be present at the ceremony of breaking ground upon their line.

The following letters from the New York Courier and Enquirer seem to give the best description of the ceremonies. We give them with a few notes of our own supplying one or two omissions.

NEW YORK AND ALBANY RAILROAD.

Pawlings, August 2, 1842.

J. W. WEBB, SIR:—The first step towards the commencement

of the important railroad communication between Albany and New York, was taken on Monday morning.

We left the city at 7 A. M. on Monday, in the Columbus, having on board the boat a party of fifty-seven gentlemen, among whom were Mr. Delafield the President, and Josiah Rich, Esq. the Vice President, with Mr Bloomfield, the Secretary of the Board of Directors. To these gentlemen, all of us were much indebted for many acts of attention and courtesy, rendering our situation perfectly agreeable. On reaching Sing Sing, we found vehicles ready to convey us to Somerstown, where we dined. The procession was accompanied by a band of excellent music, furnished by Dodworth, and as we passed through the various towns, all the inhabitants were drawn out by the sound of the music.

At many places as we passed, the men at work in the fields, knowing the object of our procession, cheered us, which was returned with hearty good will by all in the procession.

After leaving Somerstown, we reached Owenville about one and a half miles distant, and struck into the valley through which the east branch of the Croton runs, and we followed this, through some of the most fertile lands and beautiful scenery in the country, till we reached Sodom, about six miles distant.

[We may here make mention of the famous Simewong ore bed near Sodom, corners on the east branch of the Croton, to which the writer does not advert. This deposit of ore has long been known as of superior quality, and for years was carried to Danbury, Ct. The facilities offered by a road at this place would be of invaluable benefit both to the vicinity and to the city of New York. As it now is, the value of this ore is far below what it would be if its products were in a position between which and the city a frequent and certain communication existed.]

Thence we proceeded over the hills leaving the valley to the right, and about dusk arrived in the vicinity of Quaker Hill, in Dutchess county, where the company were distributed around among the inhabitants, and where we were all treated with the most generous hospitality. The view from the top of Quaker Hill is one of the most picturesque I ever beheld, comprising as it does a panorama of miles and miles in extent of the most fertile and well cultivated farms in the State. The States of Massachusetts and Connecticut are also in view from this eminence, and at the base of it on the east side, is the source of the Croton, which was visited by many of the party, who drank of the water.

The ground which is to be the scene of operation to-day, is a beautiful valley near Pawling, and the projected route of the road will run on nearly a dead level for upwards of thirty miles in a northeast direction. The whole ascent from Owenville to Chatham, which I believe is the termination of this portion of the road, is only about 8 feet to the mile, and even where it is a much greater ascent, any person who viewed the fertile plains filled with pro-

duce waiting for a market, which can now only be forwarded at a very great expense, would not, for an instant hesitate to urge and assist the immediate formation of this important and necessary road.

I need hardly say that with all whom I have met, the greatest enthusiasm prevails with reference to the road, and the firm determination of all concerned is not to pause on any account until it is completed.

The necessity of it is so thoroughly apparent, and the practicability of constructing this great work in the chain of Western transportation so feasible, I cannot doubt for an instant that the views of those so deeply interested will be carried out, and in a short time the railroad will be in full operation, through one of the richest and most productive portions of our State, not even excepting the noble valley of the Mohawk.

Among our company from New York, are Ald. Lee, Leonard and Martin, Assistant Ald. Nesbitt, Pettigrew, Brown, Atwell, Adams, Scoles, and Waterman—also Mr. Grout, and Mr. Murray of the Legislature; Judge Sherman, and Mr. Young, the contractor of this district of the road.

Every thing has been done by the gentlemen of the Board of direction to render our trip agreeable, and they have succeeded in rendering it such, in an eminent degree.

I shall write again to-night, giving an account of the proceedings of to-day.

B.

[At Armenia the iron ore is so good and abundant that within a space of 12 miles 14 furnaces are to be found yielding annually, iron to the amount of half a million of dollars. Again, we may ask, how much more would these works be worth if the communication by railroad with New York city were now in existence.]

Amenia, Aug. 2.—8 P. M.

We have just arrived here from South Dover, the last stopping place between Pawling and this place. My last was hastily closed at Pawling, and I was compelled to conclude it much more speedily than I had intended, but that the mail was momentarily expected, and I now take up the occurrence of the day from an early hour in the morning.

About seven o'clock, Mr. Bloomfield, the active and courteous Secretary, to whom all are indebted for many acts of kindness and attention, collected the party from the various houses where they had been domiciled, and proceeding to Quaker Hill, the whole body moved thence, preceded by the band playing enlivening airs.

On reaching Paulings, to our agreeable surprise and pleasure, we found hundreds of vehicles lining the road, filled with farmers and their wives and daughters, who had collected to see the ceremony of breaking the first ground for the railroad, which, when comple-

ed will confer incalculable benefits on all who have taken deep interest in it.

We found here also a party of the delegation from Troy, headed by J. C. Heartt, Esq., the Mayor, and at about eleven o'clock the procession was formed, and the band striking up a beautiful march, it moved on to the ground selected, or rather designated for the ceremony. In order to give some idea of the interest felt in the anticipated completion of this road, I will mention that the procession, though formed at a place distant from any town of magnitude, was counted as it passed over a small bridge, and was found to number twenty-six hundred and seventy, exclusive of the stragglers lining the road. The majority of these were ladies, and they seemed to take as deep an interest and to be as enthusiastic in their anticipations as were their more rugged companions.

On reaching the ground the procession filed off right and left, so as to form a large oblong, in the upper part of which were laid wheelbarrows, spades, pick-axes, crow-bars, &c. The ground was in a valley some miles across, bounded on either side by well cultivated fields, affording a truly beautiful scene.

The band was stationed in the centre of the oblong, and four spades were handed to as many *ladies* appointed to receive them, who, at a given signal handed them to the Mayor of Troy. Ald. Leonard, of New York, representing Robert H. Morris; Mr. Delafield and Mr. Rich, the President and Vice President of the Company. Ald. Leonard, Mr. Heartt and Mr. Delafield receiving them with appropriate remarks. At a word all four went into the yielding soil at once. The sod was turned up, and the first ground was broken on the line of the New York and Albany railroad. As the sods were turned the band struck up a national Air, the cannon brought to the scene for the occasion, gave forth its thundering tones, and the loud huzzas of the assembled hundreds gave token of the joy with which the ceremony inspired them, as a harbinger of future increased wealth and prosperity.

Each gentleman who chose, then proceeded to fill and wheel off a barrow load of dirt, and in a short time quite a pile of sod was collected at each side of the oblong.

The procession was then formed, and returned to Pawling, where they proceeded to an old building formerly used as a church. The ladies were first seated, and the galleries of the spacious old building were soon filled with more youth and beauty than was probably ever before seen at Pawling. When the church was filled, and order restored, Mr. Delafield, in a few remarks, introduced to the assemblage, Judge Davis of Troy, who had been requested to address them.

[The remarks of Judge Davis seem to have been rather caustic to the New Yorkers, but as they were not made in ill humor, they passed off very well. Ald. Leonard replied and urged the debt of the Croton Aqueduct, &c. as reasons why New York had not done more.]

When he had concluded a long, and in some respects, an able and effective address, Ald. Leonard arose at the request of Mr. Delafield.

When the speakers had concluded, the assemblage fell to with hearty good will upon the bounteous refreshments generously furnished by the ladies from the surrounding places. The party were soon again seated in their vehicle, and after a pleasant ride of six miles along the beautiful valley through which the road is intended to run, reached South Dover where the guests, numbering now about four hundred, sat down to dinner in the rear of the hotel, under a capacious arbor formed by laying branches of trees across posts driven in for the purpose. Thence we rode on to Armenia, where I am now writing and where we are to lodge, it being the intention of the gentlemen who control and direct our movements, to start hence at a very early hour in the morning on the route to Troy. Thus has passed the day, and thus has the first step been taken towards the construction of one of the most important schemes of internal improvement ever contemplated.

Mr. Young, the contractor of the district commencing at Pawling, has a large number of men engaged, and, as I am informed, will proceed at once with his share of the work.

I have obtained from Edwin F. Johnson, Esq. Chief Engineer of the road, a few particulars concerning the road, which may be interesting.

The commencement of the road in West Chester County, is about three hundred feet above tide water, running thence to Pawlings in Dutchess county, where ground was broke to-day. The spot where the first sod was turned, is the bottom of a broad valley, on the summit between the Croton and Housatonic river, about four hundred feet above tide water. From Somers to the summit at North East, a distance of about sixty miles, the ground over which the road is to pass, nearly a continuous level, with an ascent of about eight feet to the mile.

From North East, the road passes over the summit of the Ten Mile river and a branch of the Ancram creek, which is the highest summit of the road, and from thence to Greenbush, a distance of forty miles, there is a descent of sixteen feet to the mile. The maximum ascent on the whole line of the road is thirty feet to the mile—an ascent easily accomplished.—Of the feasibility of this road I can speak, I think, confidently, from having seen so much of the ground over which it is contemplated to construct it, and it certainly seems to abound in produce, for which New York always furnishes a market so ready. Those who have never passed through this section of the country can form no idea of the beautiful scenery by which we have been surrounded throughout the whole ride from Somers, a distance of sixteen miles from Sing Sing. The views have amply compensated all for the tedium of a ride in a hot sun in open vehicles.

At Dover, where we stopped for a short time on our road to this place, we visited the Stone Church, as it is termed, one of the most

extraordinary curiosities in nature. It has the appearance of an old fashioned church, formed by the throwing together of immense masses of rock, apparently by some tremendous convulsion of nature; and down these the water roars and tumbles, forming a scene at once sublime and appalling. A winding stair-case has been erected from the bottom up, and the whole party ascended to view this wonderful freak of nature.

The crops throughout the whole section of the country passed over by us, are said to be most abundant—and indeed as far as we could judge from appearances, such seemed to be the case.

We start to-morrow morning very early for Troy; and as I am very weary, and have a long ride before me for the morrow, I will now close.

B.

Troy, August 3, 1842.

Amid the confusion produced by the variety of scenes through which we have this day passed, I scarcely know how or where to begin my report of the day's proceedings. Since five o'clock this morning we have ridden in wagons forty-four miles—in cars twenty-two, and on the steamboat six, and we are now in Troy, seated in a parlor of the "Mansion House," with my head yet filled with the noise of music, cheers, and the firing of cannon, with which our arrival was heralded.

At four o'clock we were aroused from our beds at Amenia, where we lodged last night, and before we were half dressed, early as was the hour, half the inhabitants of the town were out to witness our departure. As the cavalcade started, a salute was fired from a cannon which the enthusiastic friends of the road had brought out for the purpose, and in a few minutes a turn of the road shut us out from sight.

Our road lay along the western edge of a broad fertile valley, teeming with the richest products of the soil, and affording a view at once beautiful and sublime. After passing along the western edge a few miles, we turned off and crossed to the eastern side of this same valley, where the view was none the less beautiful or interesting. A delightful ride of about sixteen miles brought us to North East, which is the highest summit of the road, and at this place we again crossed over to the western side of the same beautiful valley, stopping at Copaque for a short time to rest the weary horses, and procure if possible some refreshment, for we had started without breakfast. Some few of the party succeeded in procuring something to eat, but the most of them went on to Hillsdale, a beautiful and picturesque village, situated, as its name imports, amid blooming hills and dales.

An excellent meal, which some designated breakfast and others dinner, was here furnished, and about half past eleven o'clock we again mounted our vehicles to proceed *en route* for Chatham, there to take the cars of the Western Railroad for Greenbush. Up to Hillsdale, as far back as Owenville, our whole route has been in sight nearly all the time of the valley, bounded by high mountains,

through which the road is intended to pass, and I cannot forbear repeating that of this entire distance, upwards of sixty miles, there is no portion of the road so difficult of construction, as has proved many miles on the best part of the Western Railroad.

[This portion of the route has very properly been designated as the Bloomfield Pass, in honor of the successful exertions of that gentleman who discovered it in 1838. Up to that time the broad valley of the Ancram had been followed, leading to a costly summit and involving the necessity of locating some miles of the road out of the State. In 1838, Mr. B. on his own responsibility caused a survey to be made, turning to the west of Hillsdale, which entirely obviated the necessity of leaving our own State, and that too without any additional expense.]

The road for the rest of the journey was over a hilly country affording however, some magnificent views of the fertile valley which lay beneath us.

Our next stopping place was at Spencertown, in the Township of Austerlitz, one of the most romantically located towns I have ever had the good fortune to pass through.

At Greenbush we were met by a deputation of citizens and civic dignitaries from Troy, accompanied by the beautiful military company of the Troy Citizens Corps, under the command of Capt. A. Pearce, by whom we were escorted to the steamboat Jonas C. Heartt, which was waiting our arrival at the wharf. An immense concourse of citizens were also assembled at Greenbush, who seemed to hail our arrival with as much gladness as though our presence secured the completion of their road.

A beautiful sail of six miles brought us to the city of Troy, and on the voyage some minutes connected with this portion of the road were communicated to me by a gentleman from Troy, which are matters of interest as connected with this subject.

Ground is to be broken to-morrow in a beautiful meadow on the margin of the river, lying immediately below the Van Rensselaer Manor House, and the line of the road is staked out for a considerable distance. The road from Troy to a point about two and a half miles distant from the centre of the city, is to be constructed under the charter of the Troy and Schenectady Railroad Company, which is owned by the city of Troy, leaving only about four and a half miles to Greenbush to be constructed under the charter of the New York and Albany Railroad Co.—The road from Greenbush to Troy runs along the margin of the river, and with the exception of a few hundred yards of embankment, can be easily constructed.

Just before reaching Troy, the bell of the J. C. Heartt was rung to announce our arrival, and a salute was immediately commenced from the cannon stationed on the wharves near the landing. The band on board the boat struck up a national air—the thousands with whom the wharves were crowded rent the air with shouts—the cannon performed their duties admirably, and in this man-

ner we were landed in Troy. Headed by the Citizens' Corps and followed by thousands of the citizens of Troy, we marched to the admirable quarters provided for us at the Mansion House, which we entered amid the renewed cheers of the immense assemblage.

Such has been our reception at Troy: and the remembrance of it most effectually does away all the harsh things (though good naturally spoken) urged against New York by Mr. Davis, and proves that however the Trojans may think New York, as a city, backward is advancing her own interests, the citizens of New York were accepted and received as friends engaged in the same work. It is impossible to conceive the enthusiasm on the subject of this road, which pervaded all classes, at least as far as I have been able to judge from personal observation.

To-morrow will be a busy and exciting day. In addition to the ceremony of breaking ground below the city, it is the intention of our kind hosts to show the lions to us, and few will have during the day any moment he can call his own. The ceremony will be interesting and imposing, if I may judge of the preparations made for it, and I trust to do justice to it in my report.

Among the gentlemen added to our party are Messrs. Norris and Imlay, the celebrated locomotive builders, who are here, as are the rest of us, by invitation.

The same courtesy has been extended to the officers of the various roads throughout the State, many of whom have accepted, and will probably be on the ground; and as the delegation from Brooklyn is expected to-morrow, our party will be considerably increased. The road is contracted for by about thirty contractors, among whom are some of the most wealthy and experienced in the business. Mr. Farwell commences at the end of the work, and will go to work at once and vigorously. Shanties are already erected on the ground where we are to meet to-morrow, and more will be speedily built, so that, as far as outward appearances go to convince, there is every reason to believe that the work will be prosecuted with an energy and vigor worthy of its vast importance.

Troy, August 4, 1842.

The second and most exciting of the days set apart for the commencement of the New York and Albany Railroad has passed over, and in a manner which has afforded the highest gratification to all concerned.

At 8 o'clock, a cavalcade, consisting of twenty-three carriages, all well filled, left the hotel on a tour of inspection of the lions of Troy, and wonderful indeed, at least to many of us, did some of these lions seem. Our first halting place was the immense carriage establishment of Messrs. Gilbert & Eaton, which must be familiar to every person who has at any time ridden in a mail stage, for they have finished thousands of their commodious and substantial stages for almost every part of the Union. Their

establishment occupies a space two hundred and thirty-five by one hundred and fifty feet, and is most perfect and complete in all its arrangements, every article pertaining to the coaches being made within the same walls. We were conducted to every part of the building by the gentlemanly proprietors who took pleasure in exhibiting their immense works. The machines for turning spokes, sawing felloes, and plaining huge oak boards, attracted great attention as well from the novelty of the inventions (to us) as for the perfect manner in which the work was turned out. The establishment when in full operation affords employment to upwards of two hundred persons, but at present not half that number are at work.

From this place we proceed, under the guidance of the committee appointed to receive and attend to us, who were headed by the Mayor, to the celebrated Iron Works under the superintendence of Mr. Henry Burden, about two miles as I judged, from the city. These works are all kept in operation by water power, the stream used for the purpose being Winan's Kill. To obtain the proper use of this water, Mr. Burden has cut out of the solid rock, a space wide enough to admit a water wheel, fifty feet in diameter, and twenty-four feet in width. This wheel was to all a subject of the most unbounded wonder, which was rather increased, when we were told that the wheel would hold seventy-five tons of water, each bucket being eight feet deep, giving, as Mr. Burden stated, a power sufficient to raise seventy-five tons in three and a half minutes.

The immense power afforded by this wheel is made to connect by a shaft sent through a solid rock under a road, with a building where are erected the furnaces and machinery for making spikes and horse shoes. The latter article is manufactured by Mr. Burden's machine at the rate of twelve or fifteen to a minute, and he has another machine for punching the holes, and a third to make the corks.

As soon as the procession was on board the boat, (the Jonas C. Heartt,) the fasts were cast off, and amid the cheers of the immense assemblage who thronged the wharves; the music of the band, and, the roar of cannon from both sides of the river, we put out into the stream, followed by the John Mason, which was crowded almost to suffocation with citizens going down to witness and participate in the interesting ceremony.

We landed at Bath about a quarter of a mile from the spot appointed for breaking ground, and forming again in procession, with the citizens from the John Mason bringing up the rear, we marched to the spot selected, which, as I said in a previous letter, was on a beautiful meadow of W. P. Van Rensselaer, Esq., the patroon, on the east side of the river, about 2 1-2 miles below Troy.

The Troy citizens' corps, who escorted us, formed a circle round the spot staked off, into which the New York, Brooklyn, and Troy delegation were admitted, the citizens surrounding them, and looking on with deep interest as the ceremony progressed.

When all were properly arranged, Mr. Edwin F. Johnson, the

able Chief Engineer of the corps, handed four spades to Mr. Delafield, the President. Before proceeding to use them, Mr. D. placed them on the ground, and delivered, or rather read a short, but pertinent and exceedingly interesting address, which he said he had prepared during the very few hours of leisure he had enjoyed since they left New York. Mr. D. gave a brief history of railroads, which was listened to with deep attention.

Mr. Delafield then adverted to the New York and Albany railroad, which he said could be completed in twenty-four months, and with a facility not to be found for the same distance in any other part of the state.

Mr. Delafield's remarks were received with great approbation, and when he had concluded, he handed spades to J. C. Heartt, Esq., Mayor of Troy, to Mr. S. Leonard representing the Mayor of New York, Thomas G. Talmadge representing the Mayor of Brooklyn, and W. P. Van Rensalaer, Esq., the patroon on the east side of the river.

J. C. Heartt, Esq., then responded to the address of Mr. Delafield, in a very brief but happy speech, in which, after wishing all success and prosperity to the road, he pledged to that end the energy of the citizens of Troy.

He was followed by Ald. Leonard, of New York, and Ald. T. G. Talmadge, of Brooklyn, each of whom addressed a few appropriate words to the assemblage.

In a moment each gentleman's coat was off and the sod was turned up, amid cheers, music and the roar of cannon—W. P. Van Rensalaer taking, throughout, a most active part in it.

The procession was then formed again in the same manner, and marching back to the boat, we started on our homeward tour. As the Albanians had declined honoring the company with their presence, it was feared they had all left the city, and in order to ascertain that fact the boats were turned down the river, and we sailed along the shore. As we reached the city, the band on board the Jonas C. Heartt, struck up "Oh dear what can the matter be," the bell of that boat was rung, and was answered by all the boats at the wharves. Passing over to the landing of the Western railroad, where a large concourse of people were assembled, we saluted them with three cheers. We then returned to Troy, and marched in procession to the hotel, where a sumptuous dinner was set before the hungry guests, who did ample justice to all the good things provided by their generous hosts. The dinner was strictly on the Temperance plan, and consequently no toasts or speeches were made, but after the room had been nearly cleared, a social party was formed at our table, where wine, wit, toasts and speeches kept them agreeably entertained until evening drew on.

As I have in one part of this report mentioned the extraordinary works under the charge of Mr. Burden, which I inspected personally, perhaps a few words as to another establishment which time did not permit us to visit, may not be amiss.

Mr. Marshall, one of the wealthiest and most influential citizens

of Troy, has three factories or mills in operation on the Poeston Kills, just in the rear of the city, but finding that he had room and perhaps business for more, he has bored a tunnel two hundred feet under the street, through the solid rock, through which the water of the Poeston Kills is to be conducted, and run three other establishments. The cost of this tunnel has been immense, and when we consider that it was entirely a private enterprise, conceived and conducted by one man, we could not but yield our admiration to the energy and perseverance of Mr. Marshall.

And thus has ended the second day of ceremony, as connected with the long wished for commencement of the New York and Albany Railroad. I have before given my own opinion, derived from personal observation during a ride through the country of one hundred and ten miles, of the entire feasibility of making the road, in which I agree not only with the accomplished engineer of the company, Mr. Johnson, but with all who have had the same opportunities of judging as myself. The officers and directors under whose charge the construction of the road is placed, is composed of gentlemen well known as enterprising, energetic and persevering, as the following list will show :

President—John Delafield.

Vice President—Josiah Rich,

Treasurer—Jonas C. Heartt.

Executive Committee—George R. Davis, Charles H. Hall,
A. G. Hammond.

Directors—A. Sherman, Peter Cooper, Hiram Brown, J. M.
Ketcham, J. A. Taber, H. Crosby, Joel Mallary.

Agent—Joseph E. Bloomfield.

Chief Engineer—Edwin F. Johnson.

The road is needed, and that no person can deny ; and if the citizens of New York would but come to Greenbush and pass a few hours at the present depot of the Western Railroad, and see the immense quantity of freight daily passing over the road, they would, I think, with one accord put their hands in their pockets and demand the immediate completion of a railroad from Albany to New York.

And now before I close this report of the proceedings of one of the most agreeable weeks I have ever passed, justice requires at least the mention of the gentlemen, to whom all are so much indebted for the pleasure they have enjoyed.

First to Messrs. Delafield, Rich, and Bloomfield, who have had the entire responsibility of providing for and entertaining the guests, is due all thanks and praise, for their kindness, courtesy and attention, and the happy hours made more happy by their efforts, will be long remembered by all who were of the party.

To the hospitable farmers in the vicinity of Quaker Hill, and for my own part to Jonathan Akin, Esq., we are especially indebted. Their doors were freely opened to receive us, and all at their command, was tendered for our acceptance, during our brief but pleasant stay among them.

To the Mayor and committee of arrangements of Troy, whose

hospitality knew no bounds, we cannot tender sufficient thanks. Their reception and treatment of their guests, was such as all might expect from the well known hospitality of the Trojans.

Messrs. E. & W. Dorlon the gentlemanly proprietors of the Mansion House, where we were quartered, left nothing undone to render our stay agreeable; and I can do no less than commend their excellent establishment to the attention of all travellers.

The Troy Citizens' Corps, who did escort duty during our stay in Troy, is a beautiful, well disciplined and effective company, and should they ever visit New York, they will find that their courteous attention has not been forgotten.

This report is necessarily much condensed, but a proper appreciation of the value of your columns, and of the necessity of as much brevity, warns me to conclude, which I do with the fervent hope, that in two years hence, I may be one of the party who are to go from New York to Albany over the New York and Albany Rail Road.

Our Reporter has furnished us with an account of a dinner on board the steamer Troy, at which the Officers of the Company with the Delegates from Brooklyn and New York sat down, but owing to the crowded state of our columns, we are much to our regret, compelled to omit it entirely. We shall, however, endeavor to find room for it hereafter. THOMAS G. TALMADGE, Esq. of Brooklyn, presided, assisted by Assistant Ald. ATWELL, and JOSIAH RICH, Esq. Some excellent toasts were given, and a few admirable speeches delivered. The party was kept up from 2 P. M. to the arrival of the boat at the wharf in this city. The company proceed to Westchester Co. to-day to break ground there, and the work will be at once commenced with spirit.

ERRATA.—The following corrections to Ellet's article in our last number were not received until after it had been printed. :—

Page 70,—after title insert No. 1; 6th line proportioned, read *proportional*; 10th line for proportioned read *proportional*; 34th line, for per ton per mile, read per ton *nett* per mile. Page 71,—8th line for How to express, read *Now to express*; 15th line, for business exists, read *consists*.

[From the Journal of the Franklin Institute.]

REMARKS ON THE INJUDICIOUS POLICY PURSUED IN THE CONSTRUCTION AND MACHINERY OF MANY RAILROADS IN THE UNITED STATES. By John C. Trautwine, Civil Engineer.

I have read, with much pleasure, an able pamphlet, entitled "*The causes which have conduced to the failure of many railroads in the United States*," written by Mr. Charles Ellet, Jr., Civil Engineer, of Philadelphia.

Mr. Ellet proves, in my opinion, most satisfactorily, that the cause of so many failures in railroad enterprises in the United States, is not to be traced to any defect in the system itself, but to the inju-

dicious application of the resources of the companies, to the accomplishment of the object to be effected.

There has been much more money expended on many of our railroads, than either their present or prospective resources could possibly justify. Even admitting that the anticipations of their warmest advocates, as to their probable amount of trade, had been fully realized, a little calculation would show that an expenditure altogether disproportionate even to *that* amount has been thoughtlessly lavished on many of our enterprises. Indeed they have, with, however, several honorable exceptions, been commenced, and carried on, with so little reference to the principle of adopting the means to the end, that it is only matter of surprise that so great a number of them sustain themselves even so well as they do.

This position is so amply supported by the numerous failures to realize the anticipated results that were to follow the construction of many of our railroads, as to need no labored arguments in its behalf. The fact speaks for itself more convincingly than any thing I could say on the subject; indeed, I am not certain that I should have ventured to enter my feeble protest against our present heedless system of railroad making, had I not been sustained by so incontrovertible an argument: for when the current of public opinion once sets strongly into a determined channel, no matter how ill directed its course may be, it is rarely that good results to him who ventures to stem it. It is only after the vessel, entrusted to its stream, has struck upon the rocks, that one may, without apprehension of censure, strive to save the fragments of the wreck, or mark out the dangerous spot upon the chart.

The chief cause of these failures has been, as Mr. Ellet remarks, our want of attention to first principles. We are too much an *imitative* people; and, in our endeavors to keep pace with England, whose vast pecuniary resources, and concentrated commerce, enable her safely to reduce to practice those abstract principles, the union of which constitutes the "beau ideal" of a railroad, we overlook the great disparity that exists in the trade and financial capacities of the two countries;—almost unlimited in the one, but comparatively restricted in the other.

The moment news reaches us of some important change in railroad policy adopted by the mother country, no matter what expense its application necessarily involves, our engineers are not content until they effect its introduction upon the several works under their charge.

Now there is certainly nothing culpable in this disposition to avail ourselves of the experience of others;—on the contrary, where a *parity of considerations exists*, it is wise to follow the beaten track. But it is equally certain that a blind adoption of every abstract improvement—without regard to any existing disparity of means or of secondary causes calculated to neutralize its beneficial effects—may be justly deprecated.

The engineer, before he can decide properly on the details of his location, superstructure, machinery, &c., must ascertain an essential element of his decisions, not only what is the probable *amount*

and *nature* of the trade which the road will be required to accommodate, but whether or not it will present itself in such quantities and at such intervals of time, as will admit of loading the engines nearly up to their full capacity of draft.

If the trade is so heavy as to require many engines, and so regular that nearly full loads may be depended on, he will of course find it advisable to encounter great expenses for light grades, heavy rails, and powerful engines; because, abstractly considered, a certain amount of power is much more economically maintained, and applied through the medium of one large engine than of two or more smaller ones; and the use of such powerful engines necessarily involves that of proportionally heavy rails and superstructures.

Again, still further to reduce the number of engines by enabling them to draw maximum loads, the grades, or acclivities of the road, must be reduced as much as possible.

A perfect railroad would be that on which the least imaginable force would draw the greatest imaginable load; such a road is evidently a theoretical one; it can never be attained in practice; but it is the duty of the engineer to approximate to it in every instance, as closely as *the trade of the road, and the interest of the company, will admit.*

It follows then, that the above considerations of grades, weight of engines, rails, &c., although not reducible to any one fixed rule for their application to practice, still have certain limits which we may not transcend with impunity. It is plain that every railroad, to some extent, constitutes a case by itself;—it requires its own peculiar calculations; and the engineer must modify, and remodify his assumed outlays for gradients, curves, engines, rails, &c. until he attains that happy medium in each, and consistency in all, that will best subserve *the interests of the company.* That must be his guiding principle; and if he hopes in every case to attain that end, by simply making for them a railroad combining in itself all the improvements of the age, the chances are greatly in favor of his being disappointed.

It is not the *best railroad*, but the *best paying railroad*, that should be aimed at; and the two are by no means necessarily associated in our country, except in comparatively few instances.

Experience has shown that we may assume the annual expense of running such engines as are now in common use on all our railroads, at about \$5,000 each; and as \$5,000 is the interest at 6 per cent. on \$83,333, we see that the engineer may very properly incur considerable expense in diminishing the number of engines requisite for maintaining the traffic of the road. But it happens on many of our railroads that the number of engines employed, is less dependent on the grades, or even on the amount of transportation, than on the *number of trips* which the nature of the business requires to be made daily. This business may be so great as to yield a fine revenue, and yet not of such a nature as to require either high grades, heavy rails, or powerful engines; but on the contrary, such that if grades, rails, and engines of this kind be

provided for it, the result must inevitably be a failure of the enterprise.

Such are the cases that constitute the numerous railroad failures in the United States. Nothing but the want of knowledge of, and attention to, the principles that influence the expenditures warrantable in each instance for the attainment of light grades, easy curves, and heavy superstructure, has led to so general a disappointment among railroad adventurers, and excited sentiments of distrust with regard to the system itself. Indeed no argument could probably be adduced, so favorable to the merits of the railroad cause, as that it has survived the horrible manglings inflicted on it ignorantly by its best friends. It has struggled through a long and well-fought contest against both friends and foes; and now stands forth in its might, victorious, though wounded almost to the death.

The grounds of every expenditure on a railroad should be, that the annual saving thereby induced, shall more than counterbalance the interest on the increased cost. To this test, not only the general character of the line, but every deep-cut tunnel, bridge, and other important work along it should be submitted, before it is finally decided on; and this cannot be done, unless the engineer is previously in possession of some general data, as to the amount, nature, and regularity of the anticipated trade of the road.

It is upon this principle that the enormous original outlays on the English railroads are so willingly encountered. The English engineer first ascertains that the transportation will not only justify a first rate road; but that in order to accommodate it, with a due regard to economy, the road *must* be a first rate one.

But our American engineers, *as a class*, do not descend to first principles. It is enough for them, that such and such improvements have been introduced in England;—omitting all considerations of the premises, they look only to the conclusions; and the imitative faculties are forthwith called into requisition, without any regard to the modifying, and controlling circumstances peculiar to their own case. They dash on blindly in their operations, deluded by the impression that they cannot err, if they only adhere closely to their English copies. Deep cuts, high embankments, heavy rails, powerful engines, long tunnels, expensive masonry, &c. &c. are all decided on, as matters of course, whenever an opportunity offers, without a moment's reflection that the interest on their cost may never be repaid by their services—but that, on the contrary, they must for ever operate as drains on the annual revenues of the company.

Yet with the data of probable amount and nature of the trade, together with the expenses of transportation as now developed by experience, the adoption or rejection of all these things admit of an easy determination. But unfortunately it is easier to point towards England, than to make calculations even of the most simple character.

This servile imitation, or rather attempt to imitate the splendid practice of the English engineers, without either the motives, or

the means for carrying it out, has been the source of incalculable injury to the railroad cause in the United States. All would be well, were we content to investigate the *principles* upon which their practice is founded; for by adhering to those principles, we should, (as would they also in our circumstances,) arrive at a system of construction entirely different from that which their unlimited trade, and equally unlimited finances, now warrant them to adopt. The same *principles*, lead to *totally different practice*, in different circumstances.

Having ascertained, approximately, the probable amount and nature of the trade which the road will be required to accommodate, and knowing pretty nearly the rates of carriage it will bear, we arrive at a sum which constitutes the gross annual receipts of the road. If from this amount we deduct a portion sufficient to defray the annual expenses, we have the yearly profits. These profits are the interest on the principal which we will be justifiable in expending on the construction and furnishing of the road.

Self evident as the propriety of this simple precautionary process of calculation is, and impossible as it would appear to be, (and actually is,) to decide properly on the character of the contemplated road, and its machinery, without it, yet it has not probably been resorted to by the engineers of one road in ten that has been constructed in the Union. When the engineer commences his location, his aim almost invariably is, to obtain the *best abstract line*; and whether his road is to obtain 5,000, or 50,000 tons annually, the character of his grades, curves, superstructure, machinery, &c., will be precisely the same. His standard of propriety is an invariable one; it adapts itself to no contingencies; it admits of no accommodation to difference of objects to be effected. It is summed up in the brief sentence, "the English do so."

The usual routine is pretty much after this manner, viz: the survey is made; the map drawn; and the grades and curves laid down *without any reference to the object or cost of the road*;—then the calculations of costs are made;—and finally, to make both ends meet, an exhibit of probable revenue is concocted, *to suit the Report!*

The road is made; it does not pay; the railroad system "won't do." I do not mean to insinuate that this mode of proceeding is resorted to with the intention to deceive; but that it does deceive, and that ruinously, is undeniable. We are apt to be led astray by our prejudices in favor of any project in which we are personally interested. Every engineer considers his road to be a little more important than any other in the world; and under the influence of such feelings, imaginary freight flows to it, from all quarters, without limit. Like the Legislator's conscience, it is "equal to any emergency;" and it is unfortunate that it is so. Were it otherwise, reports and profits would coincide much more nearly. Now, most of our railroads that have failed to pay well, have been constructed principally for the purpose of accommodating, from two to four times a-day, the passengers, baggage, and freight brought to them

either by some other connecting line of railroad, or by stages, or steamboats. But few, if any, of those connecting large cities may be considered as failures. I hope to show that to conduct such a business as that represented in the first case, does not, as is generally supposed (and practiced on) necessarily involve a company in enormous expenses, for easy grades, powerful engines, and heavy rails. In attempting this, I shall, for the sake of illustration, suppose a case, and carry it through.

The amount thus to be transported, say only twice a day (once in each direction) may, generally speaking, be carried by a single light engine, weighing, with her complement of fuel and water, not more than six tons, over grades as high as sixty feet to a mile, by merely slackening her speed at such points.

Let us suppose that an engine of this light weight, would take, over such grades, a gross weight of only thirty tons, exclusive of her tender; and let us see how much business one such trip daily, in each direction, would amount to in a year, of 300 working days. At first sight, this may appear to many of my readers, like taking a very contracted view of the subject; but before we conclude, it may, perhaps, assume a somewhat more imposing aspect. The six ton engine is assumed merely to show how small a power can, on a railroad, satisfy a considerable business. In practice I should recommend, for such a superstructure as is hereafter described, eight ton engines.

Gross load of an engine weighing six tons, with her compliment of fuel and water in the boiler, but exclusive of her tender, over grades of sixty feet to a mile. Tons.

40 passengers and their baggage,	4
Passenger cars, - - - - -	7
Freight, - - - - -	12
Freight cars, - - - - -	7

Total, - - - - - 30 tons, gross load.

Now if we suppose only one such trip daily in each direction, and assume 300 working days to the year, we have annually,

24,000 passengers.

7,200 tons freight.

Let our road be fifty miles long;—the charge for passengers \$2.50;—and for freight \$4 per ton. Then we have for the gross income of the road,

24,000 passengers, at \$2.50,	\$60,000
7,200 tons freight, at \$4,	28,800

—————
\$88,800 gross annual receipts.

And this, it will be remembered, may be accomplished by two engines, (one for each direction daily) so small in comparison to those which are now coming into favor for *all* roads, as to appear like models: and over grades of sixty feet to a mile, with an eight ton engine, an addition of about fifty per cent. might be made to the above amount of trade and income, with but a trifling increase

of expense. But now let us see whether so small an income as \$89,000 per annum, would justify the construction of a railroad fifty miles in length.

Experience has shown that the annual expenses of our railroads, generally range within from thirty to fifty per cent. of their income; varying, of course, with many circumstances, which it would not be to our purpose to expatiate on in this place. There can be little doubt that these expenses would be materially diminished on most of our roads, by the use of lighter engines and cars, lower rates of speed, and Kyanized timber for the superstructure; but, although our road contemplates all those conditions, still we shall assume fifty per cent. of the gross receipts, as necessary to defray the gross expenses.

If then from the \$89,000 of gross income of our road, we deduct fifty per cent. (say \$45,000,) for expenses, there remains the sum of \$44,000 of clear annual profit. Now \$44,000 is the interest at eight per cent. on a capital of \$550,000; which amount, and no more, we would be justifiable in expending in the construction, and equipment, of a railroad fifty miles in length, intended to accommodate so small a trade as we have assumed, in our example; and required to realize dividends of eight per cent. per annum.

If from this capital of \$550,000, we set aside \$50,000 to cover the expense of furnishing our road with engines, cars, water-stations, depots, &c., there still remains \$500,000, for the construction of the road itself; which in this case, is equal to \$10,000 per mile.

Here then it is evident, that if we wish "to keep up with the age," and to build a road of the best *abstract* character, our project must be abandoned; because the sum of perhaps from \$20,000, to \$30,000 per mile, would be required to construct such a one. And although we should even be convinced that at some future day, distant perhaps ten or twenty years, the road would, by the gradual accumulation of business, be able to realize profitable returns on this large investment, still adventurers could scarcely be found so confiding in these prospective advantages, as to embark their capital in it.

But in the case before us, I should certainly advise not to keep up with the age; but to go back to those ancient times, some five or six years past, when flat bar roads were in fashion; the old flat bar road, that has been so unmercifully crushed out of existence by our mammoth engines, of the present day. I entertain a high regard for the flat bar road; and conceive that the odium which is now attached to its memory, has not been justly incurred. Does it follow, as a matter of course, that because it is not adapted to very heavy trades, necessarily involving the use of powerful engines, and a resort to high velocities, that therefore it may not be very serviceable, nay, more serviceable than any other, in cases where the limited business admits of lighter engines, and does not justify the construction of a more expensive road? The outcry against the flat bar road, has, in my opinion, but little foundation in justice. It is, like our more permanent structures, good in its

place; and its place is, where light engines, moving at moderate velocities, can satisfy all the demands of the trade at less expense than heavy engines on the more permanent roads can do. And such cases are very numerous. The reader cannot, I presume, infer from this, that I should recommend to substitute the flat bar for the 75 lb. rail on the Liverpool and Manchester road; in that event, I should, beyond all controversy, be "behind the age;" but, by inversion, I conceive that any one who should advise to employ the 75 lb. rail, at its enormous expense, upon a road on which the cheap light bar would answer every purpose, would be equally open to censure. However, we are digressing from our subject; let us see what kind of railroad we can construct for 10,000 per mile.

In the first place, I would limit the weight of the engines to the maximum of eight tons; and would allow no greater weight on any one engine or car, than one ton. The speed of passenger trains should not exceed twelve or fifteen miles per hour; nor that of freight trains seven or eight miles. The grading, it is needless to say, should be for a single track; the acclivities should coincide as nearly with the natural surface of the ground as the maximum would admit of, provided said maximum did not seriously interfere with the time of making the trip, or render assistant power necessary. Sudden changes of grade should of course be eased by vertical curves. But trifling expense should be incurred, for horizontal curves of greater radius than about 1500 feet; and should any very serious object require it, I should admit of radii as short as 300 feet.

The superstructures if not piled, should consist of log cross-ties, and of six by six inch strings, supporting a flat bar, or rather flanch'd bar, similar to that on the South Carolina railroad; but smaller.

Finally, the whole of the timber should be thoroughly Kyanized, or otherwise protected from decay.

Now, so far from expecting this superstructure to be knocked to pieces in a few years, as the old flat bar roads generally were, I should calculate on its annual repairs being less than on perhaps any railroad in the United States: and that, not from any inherent virtue in the road itself, but from the simple fact that *all its parts are fully proportioned to the offices they have to perform.* We should have no crushings or deflections here; but with its light engines, it would be one of the stiffest roads in the Union; and moreover, a much more agreeable one to ride on, than any of those of more permanent construction. Beside which, it would annually yield eight per cent. clear profit in its cost, when doing only the moderate business of one trip daily in each direction, with a small *model* engine, over grades of sixty feet per mile; or, should the business require the use of eight ton engines, it would yield twelve per cent. profit on the same number of trips: or should two trips daily in each direction be necessary with such loads, it would yield twenty four per cent. profit.

Below is an estimate of its cost. If the professional reader should think the item of grading too low, (and it is, I suspect, the only one on which he will have any doubts) let him take the profile of almost any road in the United States, and relocate it, in imagination, so as to adapt it to sixty feet grades, and he will find the allowance to be ample.

<i>Estimate per mile, single track, of such a Railroad as the foregoing.</i>	
Grading, culverts, drains, road-bridges, &c.,	\$4,000
Fencing, (1400 panels at 50 cents, \$700 ; but allowing fencing only half way,) 350	
Land damages, 400	
Cross-ties—1760, at 25 cents, 440	
String timbers, 35 thousand feet board measures, at \$25, 875	
Iron flanged bar—24 tons, at \$65, 1,560	
Splicing plates, 30	
Spikes, 100	
Workmanship, 1760 lineal yards, at 50 cents, 880	
Surveys, engineering, instruments, &c., 800	
Earle-izing, 13,000 cubic feet, at $2\frac{1}{2}$ cents, 325	
Incidentals, 220	
Total,	<u>\$10,0000</u>

In northern climates, a small addition to this sum would be advisable for broken stone under the cross-ties.

Thus we see, that such a road as we speak of, can be constructed for the moderate sum of \$10,000 per mile. Yet how many railroads are there in the United States, not enjoying even the limited business to which this road is adequate at two trips daily, on which not only thousands, but tens and hundreds of thousands have been thoughtlessly squandered for light grades, heavy rails, and powerful engines.

[TO BE CONTINUED.]

At the request of a friend we insert the following portion of Mr Herapath's observations upon four and six wheel engines, which relate to cross sleepers and longitudinal bearings.

CROSS SLEEPERS AND LONGITUDINAL BEARINGS.

On this railway I had an opportunity of making some observations, which it may not be amiss here to record. In our travels from Nottingham to Leicester, on Wednesday morning, there having been previously a little rain, I was struck with observing the rails which lay on cross sleepers hold their wet and dampness much longer where the ballast came up to them and was within two or three inches of the top of the edge of the rail; and to part with it much earlier when the ground was hollowed out, and clear of them, to drain the surface. This was not universal, but it was so very general for nearly the whole distance, as obviously, to make it, where it was not, the exception to the rule. What may have been the cause, unless it being a mild morning the ballast was much

colder than the atmosphere, and communicating that cold to the iron in contact with it, prevented the quick evaporation of the wet, I am unable to explain. Mr. Kearsley, whose attention I called to the phenomenon, at first thought it might be owing to the air having a freer circulation round the rail where the ground was hollowed out, which caused a quicker evaporation; but I was not satisfied with this explanation, and I do not think he was at last, inasmuch as there was little or no current of air, and the appearance was observed in nearly all situations.

The next day we had an opportunity of traveling over stone blocks, cross sleepers, and longitudinal bearings, the two latter in an instructive variety near Rugby. The unpleasant rigidity and harshness over the stone blocks were very sensible, but our attention was chiefly drawn to the comparison of cross sleepers with longitudinal bearings. I had previously mentioned some experience on the Hull and Selby Railway (which I shall hereafter detail,) of the greater draught over longitudinal bearings than over cross sleepers, with which he said his observations agreed, and now we endeavored to appreciate the comparative effects of the two as we traveled along. It appeared to me, and I believe to him, that the train ran much heavier on the longitudinals, which, like traveling over a heavy road, one easily feels; and between the sounds over the two there was no comparison. Over the cross-sleepers the train run with comparative silence, but over the longitudinals there was a constant heavy murmur and noise. These phenomena of draft and noise happened not in one place, or change, only, but in every one—of which we had a much greater variety than I could have expected to meet with on any line. *To me the observations on this line are satisfactory in favor of cross-sleepers, as to lightness of draught and absence of noise.*

* * * * *

In the early part of this article I have hinted at some curious facts mentioned to me by Mr. Gray, *relative to longitudinal bearings and cross-sleepers.* The difference of draught in hoar frost and wet weather, Mr. Gray affirmed—and the affirmation was borne out by the testimony of one or two of their men, to whom I spoke on the subject—*was as much as 50 or more per cent. against longitudinal bearings,* the draught being as much greater upon them than it was upon cross sleepers. For instance, they assured me that oftentimes when the engine could with difficulty draw its load upon a level, over longitudinal bearings, it would trip up easily enough a rise, which they called their “bank,” of 14 or 16 feet a mile, in which the rails were laid upon cross-sleepers.

To me, at first, this was a poser, the solution of which I could not so much as guess at. Being, however, informed that the hoar frost seized the rails on the longitudinal bearings earlier, and left them much later, than it did those on cross-sleepers, I immediately divined the cause, and saw a beautiful, because an altogether unexpected, illustration of the truths of natural philosophy. It is known to philosophers, that before dew can be deposited on any

body, this body must become colder than the atmosphere around it, and that hoar frost is nothing but dew, frozen, by the temperature of the body on which it is, having sunk below the freezing point, that is, below 32° of Fahr. It is also known, that the temperature of the earth, a little distance below the surface, is, at night generally higher than that of the atmosphere. Wood is comparatively a non-conductor of heat. Therefore, and because the rails, where there are cross-sleepers, are embeded in the ballast to within an inch or two of the top of the rail, and iron is a good conductor of heat, whatever heat the rails lose by radiation, on account of their rough surface, is quickly and wholly, or in a great measure supplied from the sub-soil, where there are cross-sleepers, while it is not so where the rails are kept from a communication with the subjacent ground, by the broad and deep wood of the longitudinal bearings. The consequence is, that the rails on the longitudinal bearings lose more heat, and faster, and of course become colder earlier, and continue so longer, than those on cross-sleepers. Of course the deposited moisture from the atmosphere is earlier and more copiously condensed, and quicker and harder frozen, upon those than upon these. Hence the whole phenomena of heavier draught, arising from longer and greater slipperiness, upon the longitudinals, and, perhaps, at times of their being slippery when the cross-sleepers are wholly dry, and free from hoar frost.

As a confirmation of this, I may here mention what I observed Tuesday morning, Dec. 21st, upon the Bristol and Exeter Railway. It had been a calm and clear night, for the whole surface of the vegetable country was covered with a thick and hard hoar frost, which can take place in such circumstances only ; and the stagnant water was everywhere covered with a thick coat of ice. The rails themselves were so covered with hoar frost, that we were obliged to have the assistance of a pilot engine ; and yet with all the united power of two Great Western engines, our speed was comparatively slow. Being upon the platform of the engine, my attention was quickly caught by here and there perceiving patches on the rails, of one to one and a half feet, or perhaps more, perfectly dry and free from hoar frost, amidst the all but universal white which prevailed. Struck with the phenomenon, I looked more closely for something which might develop the cause, and soon saw that these exceptions to the hoar frost invariably appeared over the places where the longitudinal bearings abutted against each other. I called the attention of a relative of mine, who was upon the engine with me, to it, and we observed it for many miles together ; so that I am quite satisfied it was owing to no local or accidental circumstance.

The explanation of this—which I call singular and important phenomenon, as bearing upon the relative advantages of two modes of constructing the upper works of railways—is simple and easy. The space between the ends of the longitudinal timbers is too small, and the timbers themselves too large, and maintain too high a temperature, for the hoar frost to affect the ground between them ; the

consequence is, during the still and clear night, heat is constantly communicated to the rail above by radiation, but chiefly, I apprehend, by the conduction of the atmosphere; by which means it is kept at a temperature that prevents the deposition of dew, and consequently the formation of hoar frost. This effect is of course not confined to a point, but by the conducting power of the metal, diffused some little distance on each side the joining of the timbers.

Thus, if phenomena and circumstance were carefully attended to, many a lesson might be learned which would lead to improvement, and save hundreds of thousands in the construction of these costly undertakings. But to do it effectually, men must have courage to resist the allurements of comfortable carriages, and travel upon the engine—the only place where observations can efficiently be made—in all seasons and in all weathers. But our philosophising has carried us for the present too far from our friends on the Hull and Selby Railway.

Mr. Gray observed that frosty mornings were not the only times at which they found longitudinal bearings of much heavier draught than cross-sleepers. In wet weather it was the same, and the longitudinals much the heavier to travel over. As it had happened that rain to some extent had fallen, in the night preceding the morning on which we were out, we had an opportunity of witnessing the effect near one of the stations. A train was coming up, and we walked some little distance down to meet it. On its passing, I observed, even under the nail which fastened the rail to the timber, that water was expressed from between the timber and metal, as the engine passed, and re-absorbed the moment after. The same phenomenon, but in an inferior degree, occurred as the carriages passed. Hence, as Mr. Gray observed, “wherever the wheels are, in wet weather, it is a valley, and they are in the position of constantly ascending a hill,” which of course much increases the draught.

In very dry weather, Mr. Gray does not think there is much difference between continuous bearings and cross-sleepers. From what I observed on the Midland Counties Railway, I am somewhat sceptical upon this. *I fear the draught is greater, under all circumstances, upon continuous bearings,* and, if I understand them rightly, I think Mr. Kearsley, the superintendent of the locomotives, and Mr. Woodhouse, the engineer of the Midland Counties Railway, are of the same opinion. It is, however, a matter well worth trying, and one which I should like much to put to the test of accurate experiment.

[TO BE CONTINUED.]

EXTRAORDINARY RACE.—On Monday morning, at five minutes past five o'clock, thirty two carrier-pigeons, belonging to different persons at Brussels, were let loose at Liverpool, and started off with the swiftness of wind on a race to the Belgian capital. They had been brought over to this place covered up in a basket for a grand

trial of their swiftness and sagacity in returning to their homes, and the winner of the race will carry off a handsome sweepstakes. They were set at liberty in the neighborhood of St. Luke's church, and immediately rose to at least double the height of its tower, after which they all started off to the southeast, the direct route to Brussels, with incredible rapidity. When they were let loose the morning was bright and beautiful, but if the rain should have been as heavy in the southeast during the day as it was here, their flight will have been greatly impeded, and some of them will be likely to lose their way across the channel. We shall be curious to hear the result of this extraordinary race.

SPONTANEOUS COMBUSTION.—A case of spontaneous combustion occurred in Hartford, Connecticut, recently. In drawing linseed oil, some of it was spilt on the floor: it was absorbed by a coarse sponge, and placed on a shelf. The smell of something burning led to an examination of the premises, when the sponge was found in a state of combustion, and just ready to burst into a flame. Only about two hours had elapsed between the time of using the sponge and the discovery.

RAILWAY AND STEAMBOAT TRAVELLING.—From a report made to the London Board of Trade on the comparative safety of steamboat and railway travelling, it appears that from the first of January to the first of July, 1841, but thirty lives were lost by railroad travelling. Of these, three passengers lost their lives from causes beyond their own control; two suffered from their own folly and negligence; five were trespassers on the road; and the remaining twenty were engineers, laborers, and workmen on the line of the railway. The number of passengers travelling was nine million one hundred and twenty-two thousand, distance travelled one hundred and eighty two millions four hundred and forty thousand miles, and the number of persons killed from causes beyond their own control was three, or one out of three million forty thousand six hundred and sixty six passengers; or, in other words, one passenger lost his life for each sixty millions eight hundred and thirteen thousand three hundred and thirty three miles travelled.

The author of the report, Mr. Lang, shows by a number of facts that railways are the safest of all modes of conveyance, and more particularly safer than steamboat travelling.

Her Majesty's steam frigate *Penelope*, now fitting at Chatham, is ordered to be rigged with Andrew Smith's patent wire-rope. The experiment made at Portsmouth on this rope a fortnight since, in the presence of Admirals Codrington, Bouverie, and Percy, and many other officers of high rank and experience, were highly satisfactory, both in proof of its immense strength and the facility of splicing.

The new canal steam packet *Gallant* returned to Georgetown on Saturday from a trip to the Great Falls of the Potomac. This trip, it is said, has dissipated every doubt upon the subject of the application of steam power to the navigation of the Chesapeake and Ohio Canal.